Saskatchewan
Agriculture
and Food

FINAL REPORT

Agriculture Research Branch
Saskatchewan Agriculture and Food

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AGROFORESTRY IN SASKATCHEWAN

Funded by
Technology Adoption Demonstration

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AGROFORESTRY RESEARCH PROPOSAL

FINAL REPORT TO THE TECHNOLOGY ADAPTATION AND DEVELOPMENT PROGRAM (TAD)

SASKATCHEWAN AGRICULTURE AND FOOD

BY

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Introduction

It is generally believed that the implementation of agroforestry in the province may provide wide-ranging ecological, social and financial benefits to the people and businesses operating in Saskatchewan and to the farming community of this province. Hence, a TAD application for funding was filed to examine the development of an agroforestry educational and research infrastructure in Saskatchewan.

Very limited knowledge of how to set up a new agroforestry program that will satisfy the needs of the general academic community, government, the public, researchers, farmers and corporations and how to coordinate the various other possible interest groups is available. Since various forms of agroforestry programs are operational at other universities, it was the intent of the applicants to review what is taking place in terms of agroforestry development in other jurisdictions in North America.

The ultimate goals of the TAD project were to examine how other universities and research organizations on this continent could support the research and development of commercial and environment-friendly farm forestry as an integral part of a sustainable agricultural system and to supplement and protect the biodiversity and natural resource base of Saskatchewan.

This document reviews the extent of the discussions held and proposes a course of action for the future.

Short Review of the Application

The original application to TAD was filed by Dr. Andre Hucq of the University of Saskatchewan on behalf of the Education Co-ordination Committee of the Agroforestry Opportunities Team, Saskatchewan Agriculture and Food and the Agroforestry Teaching and Research Development Committee established by the Dean, College of Agriculture at the University of Saskatchewan.

The goal of these two committees is to further the advance of knowledge of agroforestry in Saskatchewan.

1. The Opportunities Team's role is to investigate and report on options for agroforestry within the Province. A number of subcommittees have been struck, which include the education co-ordination sub-committee. This committee's goals are to provide coordination, assistance and support to the academic institutions in Saskatchewan (Universities, Colleges, etc.) who will be involved in training, education and research programs for the agroforestry industry in the province and in Canada.

2. The College of Agriculture at the University of Saskatchewan has also set up a team within the College to investigate that possibility of establishing an "Agroforestry Teaching and Research Unit" that would, in due course, make the College and the University the leading Centre in Canada for agroforestry learning.

Attachments

The following documents are attached to this report and form an integral part of the document:

1. Preliminary report to the dean of the College of Agriculture, University of Saskatchewan: Research into intensive land management on the Prairies: Program for the development of an agroforestry industry in Saskatchewan.

A copy of this document has already been filed with TAD.

2. Letter to the Natural Science and Engineering Research Council (NSERC), Ottawa.

Extent of Review

The applicants visited the agroforestry facilities and held discussions with agroforestry researchers at:

- The University of Missouri;
- The University of Wisconsin
- The University of Minnesota;
- The University of Nebraska
- The University of Florida
- The University of Guelph
- Queens University, Ontario

Applicants also held discussions with officials of the Forest 2020 Secretariat, the office of the Minister of Natural Resources (NRCan) and at NSERC in Ottawa. NSERC is the Federal government's principal source for funding for research in the fields of the natural sciences and engineering.

In these discussions, applicants were represented by Mr. Ernie Donnawell of Saskatchewan Agriculture Food (SAF), Dr. Andre Hucq of the University of Saskatchewan, Dr. Mark Johnston of the Saskatchewan Research Council and Mr. Jonathan Matthews of Saskatchewan Environment and Resource Management (SERM).

Recommendations

Educational, Research and Extension Priorities

Saskatchewan Agriculture and Food (and other provincial departments) should:

- Work closely with the University of Saskatchewan and the other educational facilities in the province to develop the research, education and extension needed for the successful long-term development of agroforestry in this province;
- Facilitate cooperative educational and research programs and networks with U.S. and other Canadian universities to educate and train individuals in agroforestry practices for application in Saskatchewan. The University of

- Guelph in Ontario and Université Laval in Quebec should be included in this program;
- Provide Assistantships and Stipends to cover the cost of in and out-of-province tuition to students[1];
- Determine and suitably fund research projects that address strategic issues:
  - Contribution to the provincial timber supply in the forest fringe area;
  - Biomass to foster and facilitate the development of biomass for energy source;
  - The range of other possible agroforestry systems (silvopasture, bioremediation, biotechnology, etc);
  - The socio-economic implications of the introduction of agroforestry systems to rural areas;
- Develop guidelines to communicate outcomes of key research projects (extension); Provide for farm forestry market information services (target users, delivery methods, implementation);
- Set up provincial workshops to develop a framework for the development of agroforestry in the province;

Additional Priorities

- Set up a formal program within SAF to provide support for intensive land management directed at agroforestry on the Prairies;
- Target appropriate joint venture partners such as the Forestry Centre in Prince Albert, forestry companies and farmers groups;
- Investigate potential cost sharing arrangements for agroforestry projects;
- Purchase/rent initial 320 acres of suitable land for research purposes[2];

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[1] It is recommended that the program should be encouraged to "grow" from within i.e. graduate students (M.S. and Ph.D. level) interested in developing agroforestry research and outreach in Saskatchewan should be drawn into the program

[2] One possible option would be to link the agroforestry research land with land that the University will need to acquire for the relocation of the livestock farm.

Report of Activities

A review of the discussions held at the universities mentioned below are contained in the attached document that has already been filed with TAD and are reproduced on the following pages: Preliminary report to the dean of the College Of Agriculture, University of Saskatchewan. Research into intensive land management on the Prairies: Program for the development of an agroforestry industry in Saskatchewan.

- University of Missouri Center for Agroforestry,
- William F. Heckrodt Program of Excellence for Fiber Crop Development and Utilization,
- Center for Integrated Natural Resources and Agricultural Management (CINRAM),
- The (U.S.) National Agroforestry Center,

The following (new) sections review the discussions held at:

- The University of Florida
- The University of Guelph
- Queens University, Ontario
- Forest 2020 Secretariat,
- BIOCAP;
- The office of the Minister of Natural Resources, and
- NSERC

The University of Missouri Center for Agroforestry,
College of Agriculture, Food and Natural Resources,
University of Columbia,
Missouri.

Meeting with:
Harold E. "Gene" Garrett - Director
Sandra S. Hodge - Technology Transfer and Outreach
John Shopland - Director, Horticulture and Agroforestry Research Center

The University of Missouri Center for Agroforestry is an interdisciplinary research, teaching and technology transfer program that draws on the expertise of the University of Missouri faculty in:

- Forestry;
- Fisheries and wildlife;
- Entomology;
- Plant pathology;
- Agronomy;
- Animal science;
- Agricultural economics;
- Rural sociology;
- Horticulture, etc.

The mission of the Centre is to initiate, coordinate and enhance agroforestry activities to meet the environmental, social and economic needs of land management in Missouri, North America and the temperate zone worldwide. The Centre has over twenty-five affiliated faculty from departments spanning both the biophysical and socio-economic sciences. Cooperation also extends to state agencies such as the Missouri Department of Conservation, and federal agencies, including the Natural Resources Conservation Service, and the USDA Forest Service Central Hardwood Research Station. Beyond Missouri, collaboration extends to personnel located at the USDA National Agroforestry Center in Lincoln, Nebraska and faculty at Iowa State University, USDA Agricultural Research Service, Booneville, Arkansas, and the Environmental Protection Agency (EPA). Funding for the Centre is "soft money" that extends into the many millions of dollars (probably in the range of US $10 million - US $20 million).

The University of Missouri's 660-acre Horticulture and Agroforestry Research Center is a key resource for education, research, training and demonstration. It is the focal point for agroforestry research in the State of Missouri and the Center for Agroforestry. Both basic and applied research is conducted in the biophysical and socio-economic sciences. Research undertaken there includes:

- The human dimensions of agroforestry adoption;
- Alternative crop production;
- Tree-crop interactions;
- Genetic improvement of high-value trees;
- Plant diversity and pest management;
- Mitigation of non-point source pollution;

- Shade and flood tolerance studies, and;
- Wood quality and utilization.

Current funding sources include the Agricultural Research Service and the Environmental Protection Agency. The EPA funding supports an Agroforestry Floodplain Program whose objectives are to research and demonstrate agroforestry's ability to generate income, reduce non-point sources of pollution, sequester carbon, create and improve wildlife habitat and mitigate against the impacts of periodic flooding. The Agroforestry Floodplain Program research effort includes support for graduate education.

Other long-term goals of the Center for Agroforestry include:

- Provide formal educational opportunities in agroforestry through the University of Missouri;
- Conduct, coordinate and promote interactive research on agroforestry practices to improve the production and protection functions of agricultural and forest lands;
- Conduct, coordinate and promote interdisciplinary research on the social and economic dimensions of agroforestry;
- Conduct, coordinate and promote interdisciplinary research on the policy dimensions of agroforestry;
- Develop and carry out a collaborative international agroforestry program in the areas of instruction, research and outreach;
- To conduct an outreach program in order to increase the awareness and adoption of agroforestry practices.

The instructional program of the Center for Agroforestry offers courses for graduate students interested in agroforestry practices, research and outreach. The Centre has graduate assistantships available at both the M.S. and Ph.D. level. Assistantships include a stipend and cover the cost of in-state or out-of-state tuition.

Key points:

- Large pool of resources;
- Full time staff + access to large pool of interdisciplinary faculty members;
- 20 + years in agroforestry education and extension;
- Willingness to do joint work with the University of Saskatchewan;
- Large agroforestry research centre;
- Little hybrid poplar work but extensive work in other areas of agroforestry (e.g. silvopasture);
- Extensive knowledge in the field of technology transfer;
- High level contacts with officials of the U.S. government;
- Large database;
- Large network of agroforestry experts;
- Established up-to-date workshop program;
- Can send students there immediately.

The William F. Heckrodt Program of Excellence for Fiber Crop Development and Utilization,
Department of Forest Ecology & Management,
College of Agricultural and Life Sciences,
University of Wisconsin - Madison,
Wisconsin.

Meeting with:
Glen R. Stanosz - Program Director
Jill M. Calabro, Associate Outreach Specialist
Martha Rosemeyer - University of Wisconsin, Department of Agronomy
Gregory Rebman - Natural Resources Conservation Service, U.S. Department of Agriculture

The William F. Heckrodt Program of Excellence for Fiber Crop Development and Utilization was established from a grant of approximately US $2 million by Mr. Heckrodt. The program supports outreach and research to develop and utilize poplar and other trees as sources of raw materials to meet the future fiber, timber, and energy needs of Wisconsin.

A director drawn from the faculty in consultation with the Program Advisory Council runs the program. This council consists of:

- The program's faculty director;
- Mr. William Heckrodt;
- Two forest science faculty members, and;
- Forest industry and energy industry representatives.

The faculty director is responsible for fostering cross-departmental, interdisciplinary activities, both outreach and research oriented. The fiber crop outreach specialist accomplishes the outreach goal of the program. The research goal is accomplished through the research work of the faculty director and through the combined research efforts of faculty across the University of Wisconsin - Madison campus as solicited by the faculty director. The faculty director is the recipient of the Heckrodt Professorship to support his research program in this area.

The fiber crop outreach specialist coordinates the acquisition and dissemination of existing practical information on poplar profitability, establishment, and growth. This includes data on:

- The best available clones;
- Site preparation;
- Planting;
- Maintenance practices, and;
- Pest management.

This information is integrated into guidelines with the goal of empowering growers to realize maximum returns.

The outreach specialist also established demonstration plantings for grower education and to compare clonal responses to different practices and site factors. Additionally, the

outreach specialist develops university literature and other educational materials targeted at Wisconsin growers and acts as a liaison and conduit of information from other institutions and agencies including the U.S. Forest Service. Finally, the outreach specialist conducts field days, workshops, and demonstrations to stimulate poplar plantation establishment. The outreach Specialist provides a quarterly report of activities to the Advisory Council.

A competitive grants program funded by the program solicits proposals in the most relevant areas. Prospective areas of emphasis include, but not limited to:

- The development and commercialization of the poplar resource;
- Establishment and culture to maximize productivity and return on investment;
- Maintaining and increasing productivity through determining the best pest management strategies and the best practices for their application
- Processing and utilization of fiber crops, including the potential use in added value products;
- Determining the profitability and economic contribution to individual Wisconsin communities and the state economy, and;
- Discovering, documenting, and disseminating the environmental benefits of fiber crops and enhancing their positive environmental impact (including energy generation and conservation, carbon sequestration, water quality, and wildlife benefits).

Key points:

- Large pool of resources;
- Full time staff + access to large pool of interdisciplinary faculty members;
- 5 + years in agroforestry education and extension;
- Willingness to do joint work with the University of Saskatchewan;
- Extensive hybrid poplar work;
- Extensive work with industry;
- Extensive knowledge in the field of technology transfer;
- Large database;
- Large network of agroforestry experts;

The Center for Integrated Natural Resources and Agricultural Management (CINRAM),
College of Natural Resources,
University of Minnesota,
Saint Paul,
Minnesota.

Meeting with:
Erik Streed, Program Manager

CINRAM is a partner-based organization that catalyzes the development and adoption of integrated land use systems. CINRAM links the expertise of the University of Minnesota with the experience and insights of people and organizations who work with, and have an understanding of, opportunities and issues across the landscape.

CINRAM objectives include:

- Coordinating and implementing research and extension projects related to agroforestry and other integrated land use systems. Focus is on applied research on the financial impacts of specific agricultural and land use practices, so that farmers and landowners can evaluate potential profits of specific practices. Particular emphasis and experience with economic and financial analysis of growing hybrid poplar as an alternative agricultural crop.
- Linking University educators, public agency staff, landowners, business people, and others interested in integrated land use;
- Promoting and conducting educational and training activities throughout Minnesota;
- Serving as a clearinghouse and referral center for agroforestry and integrated natural resources and agricultural management;
- Encouraging a landscape level, integrated watershed approach in natural resources and agricultural management.

CINRAM encourages:

- Practices that use the land to meet both present needs and to protect its long-term integrity. The Centre attempts to build awareness of, and appreciation for, connections that already exist - between field, forest and town, producer and consumer, land use and water quality, families and farms, and between urban and rural communities.
- Profitable technologies and practices that mesh diverse land uses - crop production and water quality maintenance, agroforestry and wildlife protection, livestock production, and soil enhancement.
- Connections among individuals - researchers and farmers, agriculture and natural resource professionals, and local government leaders and the University faculty, landowners and environmentalists, industry representatives and public agency staff - who help make and implement land use decision.

The result in new links that lead to approaches that simultaneously nurture profitable businesses, thriving communities, and a healthy environment.

CINRAM has direct links to the Agricultural Utilization Research Institute's (AURI), which was created to foster long term economic benefit through increased business and employment opportunities to rural Minnesota through:

- The identification and creation of new markets for new or existing commodities, ingredients and products;
- The development of new uses or value improvements for Minnesota agricultural commodities.

AURI supports the work done by the Minnesota Hybrid Research Cooperative, which was formed in 1996 with the support of the state of Minnesota. Its mission is to:

- Produce genetically superior cottonwood and hybrid poplar trees;
- Improve cultural practices and increase wood yields;
- Provide technical assistance to cooperative members and the public.

The focus of the Cooperative is to provide a research base to produce wood fiber that has high value to the grower and the industry user. The development of new and improved cultural practices should bring costs down to increase profits to the farmers who are growing trees an alternative agricultural crop.

The current members of the cooperative include industry and research institutes:

- The Agricultural Utilization Research Institute;
- Blandin Paper Company;
- Boise Cascade Corporation;
- Champion International;
- Lee Nursery;
- Minnesota Power;
- Potlatch Corporation;
- The University of Minnesota, Crookston;
- The University of Minnesota, Natural Resources Research Institute;
- WesMin RC&D; and;
- Terra International.

Projects being implemented at this time include:

- Breeding and field-testing of new hybrids;
- Evaluation of various planting and maintenance practices;
- Evaluation of existing hybrids from throughout the northern hemisphere.

Key points:

- Large pool of resources;
- Full time staff + access to large pool of interdisciplinary faculty members;
- 10+ years in agroforestry education and extension;
- Extensive knowledge in the field of technology transfer;
- Willingness to do joint work with the University of Saskatchewan;
- Large agroforestry research centre in Duluth and elsewhere in Minnesota;

- Contract with the U.S. Department of Energy to research the use of wood products in electricity power plants;
- Extensive poplar work + work in other areas of agroforestry;
- Large database;
- Link to the Agricultural Utilization Research Institute;
- Large network of agroforestry experts;
- Established up-to-date workshop program;

National Agroforestry Center,
University of Nebraska at Lincoln,
Lincoln,
Nebraska.

Meeting with:
Greg Ruark - Center Director
Michele Schoeneberger - Research Program Leader/Soil Scientist

The USDA National Agroforestry Center has its origins in the 1990 Farm Bill. It began as a Forest Service effort in 1992 and expanded into a partnership with the U.S. Natural Resources Conservation Service in 1995. The National Agroforestry Center conducts research on how to design and install forested buffers to protect water quality and develops and delivers technology on a broad suite of agroforestry practices to natural resource professionals who directly assist landowners and communities.

Research & Development

Tree-based Buffer Technologies for Sustainable Land Use. Research conducted on:

- Studies to improve the understanding on how forested riparian and upland forest buffers function to protect water and aquatic environments from soil sediments, excess nutrients, and pesticides;
- Site-based studies for improving the ability to design and install these buffer systems under a variety of environmental conditions in order to meet landowner objectives, and;
- Landscape-scale studies to guide the strategic placement of forested buffer systems in watersheds for the purpose of maximizing water protection, while optimizing for other benefits, such as wildlife habitat, carbon sequestration, and economic diversification.
-

Technology Transfer & Applications

The Center develops and delivers agroforestry technology on a broad suite of agroforestry practices that fall into six categories:

- Windbreaks
- Riparian Buffers
- Alley Cropping
- Silvopasture
- Forest Farming
- Special Applications

The Center gathers and packages research conducted by universities and state and federal agencies into technology transfer materials. Products include field demonstrations, training workshops, a quarterly newsletter, technology "how to" notes, videos, and brochures with coordinating displays.

Key Issues that have been addressed include:

- **Carbon**: Agroforestry often involves afforestation. Planting "linear forests" on farms and ranches can store large amounts of carbon due to an extensive agricultural land base.
- **Communities**: Trees at the community/agriculture interface provide visual screening, dust and noise abatement, modify temperature extremes, and provide greenways and recreational settings.
- **Economics**: Agroforestry practices, like alley cropping and forest farming, diversify production systems and generate additional on-farm income.
- **Livestock**: Trees shelter livestock from harsh weather and reduce visual and odor problems associated with concentrated feedlots. Agroforestry systems allow for forage production and livestock grazing in the understory of conifer stands that are managed for timber production.
- **Snowfences**: Trees and shrubs used as "living snowfences" control drifting snow along roadways, distribute snowmelt in fields, protect farmsteads and communities, and provide wildlife habitat.
- **Water**: Forested riparian buffers improve water quality by controlling soil and stream bank erosion and by reducing the input of agricultural fertilizers, pesticides, and animal wastes into waterways.
- **Windbreaks**: Many field windbreaks have aged and deteriorated. They need to be replanted or rehabilitated in ways that provide for erosion reduction, crop protection, and wildlife habitat.

Key Points

- Main U.S. government research and technology transfer centre;
- Access to large resource pool;
- Full time staff;
- Extensive knowledge of the industry;
- Willingness to work with governments of Canada and Saskatchewan to develop centre in this province;
- Extensive network of researchers worldwide;
- Large accessible database.

The Center for Subtropical Agroforestry
School of Forest Resources and Conservation
University of Florida
Gainesville, Florida

Meeting with:
PK Nair, Ph.D, Director
Michael Bannister, Ph.D, Assistant Director
Sarah Workman, Ph.D, Assistant Professor

The Center for Subtropical Agroforestry (CSTAF) is a multidisciplinary, multi-institutional initiative established within the School of Forest Resources and Conservation (SFRC) to undertake activities in research, extension, and education and training related to agroforestry[3]. This research provides the scientific foundation for agroforestry applications and helps develop appropriate technologies.

The rationale for the creation of the centre is that agroforestry represents an integrated approach that cuts across disciplinary boundaries. Its principles are widely applicable; yet there are specific local problems that warrant situation-specific research. Research results will need to be disseminated effectively to the targeted clientele. Any single institution cannot effectively undertake this complex task, so that a coordinated effort is needed. Uncoordinated efforts will lead to duplication of efforts and wastage of resources. A consortium of disciplines, institutions, and locations would, therefore, be the best approach.

The extension component of the Center focuses on:

- Increasing the adoption of agroforestry practices.
- Training and education activities will be targeted to the increasing need for trained professionals and training the landowners in agroforestry techniques.

Established with the support of a four-year USDA grant to the University of Florida, the Center focuses its attention on the southern and southeastern parts of the United States, but it is envisioned to be an eventual world leader in agroforestry. The Center is committed to developing agroforestry systems that are economically and environmentally interesting to landowners in the Southeast United States.

The objectives of the Center include to:

- Undertake agroforestry research relevant to south and southeastern U.S. and elsewhere in the subtropics and link with on-going work in this area internationally;
- Develop appropriate mechanisms for disseminating the results of research to targeted clientele; and
- Support education and training in agroforestry at various levels ranging from farmers and other land-users to scientists and other professionals.

Professor Nair attended the Agroforestry conference in Regina in August 2001 together with Drs. Bannister and Workman. Dr. Bannister and Dr. Workman were also invited

[3] http://cstaf.ifas.ufl.edu/personnel.htm

to visit the College of Agriculture at the University of Saskatchewan where they met several members of the Agroforestry committee.

Key points:

- Large pool of resources (over US $5 million);
- Full time staff + access to large pool of interdisciplinary faculty members;
- Extensive awareness on issues of agroforestry education and extension;
- Dr. Nair is a leading world authority on agroforestry;
- Drs. Bannister and Workman are leading researchers in this field; well known throughout the United States;
- Willingness to do joint work with the University of Saskatchewan;
- Extensive research and extension work in various fields of agroforestry;
- Extensive work with industry;
- Large database;
- Large network of agroforestry experts across the U.S.;
- Links to many agroforestry research centres (in particular the International Centre for Research in Agroforestry (ICRAF) in Kenya).

The Department of Environmental Biology
University of Guelph
Guelph, Ontario

Meetings with:
Dr. Marc Sears (Department Head)
Dr. Andrew Gordon
Dr. Naresh Thevathasan

The Department of Environmental Biology at the University of Guelph manages an Agroforestry Research farm, which is situated a few miles from downtown Guelph, and the University. The farm has been in operation since the middle of the 1980's. This research facility has been used extensively over the last 15 years for agroforestry research but it is currently under a threat of closure because the land has become so valuable for housing redevelopment.

The Department of Environmental Biology provides a focal point for multidisciplinary research in environmental, biological and toxicological aspects of pesticide use; the management of insect pest populations; apiculture and pollination biology; the biology and control of weeds; the etiology and control of plant diseases; environmental quality as related to waste management and utilization; agroforestry; stream reclamation; and, environmental microbiology.

Dr. Gordon is a Professor at the University of Guelph where he is also the Director of the Agroforestry Research Program. Dr. Gordon studies the use of agroforestry in environmental systems, conducting research in a diversity of agroforestry areas such as inter-cropping, stream rehabilitation, windbreaks and silvopastoral systems. Dr. Gordon is an expert in the field of agroforestry to remedy or prevent environmental deterioration. He has been involved in a number of international agroforestry projects in Nepal, Ghana and Bolivia and he and his "post doc" research assistant, Dr. Thevathasan, are currently involved in an agroforestry project in Southern Africa. He has been active in the study and promotion of agroforestry in North America and chaired the first North American Agroforestry Conference at the University of Guelph in 1989. Dr. Gordon's programs include ecological interactions in forest and agroforestry ecosystems, carbon dynamics, nutrient cycling, and ecological modelling.

Key points:

- Existing well established agroforestry research facility;
- Dr. Gordon and Dr. Thevathasan are well known in the field. Dr. Gordon is the author of a leading textbook on temperate agroforestry systems;
- Dr. Gordon has already presented his work a the University of Saskatchewan and at an ADF meeting;
- Familiar with and supports the NSERC network proposal;
- Extensive awareness on issues of agroforestry education and extension;
- Willingness to do joint work with the University of Saskatchewan;
- Large database (including GIS/GPS);

BIOCAP
Queens University
Kingston, Ontario

Meetings with:
Dr. David Layzell, Executive Research Director
Ms Holly Mitchell, Executive Managing Director

The BIOCAP Canada Foundation began a few years ago as a network of university researchers led by Dr. Layzell of Queen's University[4].

Shortly after the Kyoto agreement, an informal group of university researchers met to discuss the scientific vacuum that surrounded carbon sinks. They wanted to look at ways of enlisting Canada's forests and farmlands to help reduce greenhouse gases - to capture Canada's Green Advantage. Following a series of meetings, the BIOCAP Canada Foundation was officially incorporated as a not-for-profit foundation in August 2000. In March 2001, three federal government departments - Natural Resources Canada, Environment Canada and Agriculture and Agri-Food Canada - agreed to join BIOCAP in a five-year funding partnership. The arrangement allowed BIOCAP to set up research networks to integrate science and policy from across a spectrum of university as well as government, industry and non-government research groups. BIOCAP is creating an arm's-length forum where Canada's leading researchers and decision-makers can both listen and be heard.

The BIOCAP Canada Foundation is a federally incorporated, not-for-profit organization. BIOCAP is affiliated with Queen's University in Kingston, Ontario, but is governed directly by its members from across the country

BIOCAP's plans are to set up multi-sectoral committees in strategic areas to assist in planning a national workshop that will bring together researchers and research managers from the university, industry, government and NGO sectors. The workshops will be instrumental in developing plans for:

- National Research Networks. Multidisciplinary, multi-sectoral teams of researchers working together to address major scientific, technological or policy-relevant questions in the area of biosphere greenhouse gas management or bio-based products.
- Research Clusters. Individual researchers or small research teams who will be addressing important questions that do not fit within the mandate of the National Research Networks.

BIOCAP is currently planning four National Research Networks. These are:

- The Forest C Cycle Network;
- The Afforestation and Agroforestry Network;
- The Agricultural GHG Network and;
- The Bio-based Products Network.

[4] http://www.biocap.ca/homepage.htm

The intention is that each of the networks will include research covering the science, technology/engineering and policy/social science dimensions of the problem being studied. The Forest C Cycle Network and the Afforestation and Agroforestry Network are intended to be closely integrated with the Sustainable Forest Management National Centre of Excellence operating out of the University of Alberta. Other national research groups will be linked with the appropriate networks.

The question that needs to be considered by the applicants is to what extent does plans made in Saskatchewan to develop an agroforestry industry fit in with the BIOCAP proposals as described above. This question is currently under review.

Forest 2020, Office of the Minister of Natural Resources, and the NSERC Application

Meetings with:
Ms Mary Mes-Hartree, Director, Forest 2020 Secretariat
Dr. Pierre Charest, Director, Science Programs, Science Branch, NRCan
Staff of the Forest 2020 Secretariat
Dr. Dan Wicklum, office of the Minister of Natural Resources.
Ms. Theresa Anderson, Program Officer, NSERC

Forest 2020 Secretariat

The practice of cultivating short-rotation high-yield trees is known as tree farming in many countries. Canada has the knowledge and technology to grow fiber faster. Canada has numerous competitive advantages such as sophisticated forest and agricultural sectors, an extensive land base, water resources, a highly trained workforce, political stability, and a comprehensive research capability. The key to Canada's success will likely be innovation and application of its current knowledge on tree farming using tree breeds adapted to Canadian conditions.

Under Canadian conditions, hybrid poplar can yield from 10 to 35 cubic meters per hectare per year depending on site conditions. Assuming that these hybrids are planted on 2 million hectares of suitable land capable of yielding 20 cubic meters per hectare per year[5]. In comparison, Canada's forest, with an average yield of 1.7 cubic meters per hectare per year, would require nearly 23.5 million hectares to produce the same amount of fiber. Poplar is only one among several species (for example, spruce, willow, and larch) that in research trials in Canada have yields approaching 20 cubic meters per hectare per year. Tree farming could therefore provide Canada with a new fiber asset. Federal, provincial, and territorial governments are working together to develop a "Forest 2020" approach.

A presentation on the agroforestry development work in Saskatchewan was made. Round table discussions were held following up on the presentation. Further discussions/meetings will be held at a later date to discuss further issues of interest.

Office of the Minister of Natural Resources (NRCan)

A presentation on the agroforestry development work in Saskatchewan was made to Dr. Dan Wicklum, policy advisor to the Minister, Mr. Ralph Goodale. The discussion that ensued indicated that that there is a great deal of activity at the Federal level to develop industries-based agroforestry practices in Canada.

NSERC

The Research Networks Grants program funds large-scale, complex research proposals that involve multi-sectoral collaborations on a common research theme and that demonstrate the added advantages of a networking approach involving both private and public sector partners and their contributions.

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[5] In 20 years, tree-farming harvests could substitute for 20% of Canada's current fiber supply - hence the name "Forest 2020".

The objective of the Research Networks Grants program is to foster the creation of knowledge and expertise through large-scale multidisciplinary research projects; collaboration between university- and college-based researchers and other sectors; transfer of knowledge and expertise to Canadian-based organizations; training of highly qualified personnel; and other social and economic benefits to Canada.

Following the meetings that were held with research institutions in Canada and the United States as described in this document, it was determined by applicants that an application to fund such a network should be filed with NSERC before the deadline of October 1, 2001. The letter to fund the "National Afforestation and Agroforestry Research Network" is attached as "attachment #2" on page 39.

Following discussions held in Ottawa with NSERC, it was determined that further information was needed to complete the application. The applicants intend to file the amended application to fund the network by the next deadline date of February 2002. Applicants also propose to apply for the NSERC Collaborative Research Opportunities (CRO) grants program that supports the participation of teams of Canadian researchers in major international or interdisciplinary research projects that present a special opportunity for collaboration. Collaborative Research Opportunities normally require in excess of $100,000 annually from NSERC.

Attachment #1: Preliminary Report to TAD

Research into intensive land management on the prairies

Program for the development of an agroforestry industry in Saskatchewan

Preliminary report to the dean of the college of agriculture
University of Saskatchewan

May 2001

Research Into Intensive Land Management On The Prairies

Program For The Development Of An Agroforestry Industry In Saskatchewan

EXECUTIVE SUMMARY

Purpose of Project

- To integrate sustainable and productive intensive management and agroforestry practices within Prairie farming systems;
- To develop strategies for the successful implementation of agroforestry in Saskatchewan;
- To provide for effective and cost efficient research in the province combining existing infrastructure - for example, the University of Saskatchewan and the PFRA Shelterbelt Centre in Indian Head;
- To integrate all interested groups into an effective working unit for developing the industry in Saskatchewan;
- To develop cost-effective agroforestry systems to meet the commercial and environmental objectives of the people of the province;
- To identify impediments and opportunities to agroforestry;
- To provide for appropriate educational programs to interested groups;
- To provide for efficient and complete information flows and extension;
- To review how agroforestry can contribute to sustainable management of Saskatchewan's natural resources;
- To optimize the productivity of crops, pastures and other products from the soil;
- To promote returns and fair income from tree production;
- To promote suitable tree species development;
- To provide effective management systems for landowners in terms of developing sound agroforestry practices.

Agroforestry

Agroforestry is "intensive land management that optimizes the benefits (physical, biological, ecological, economic, social) arising from biophysical interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock"[6].

With growing concerns over low commodity and high input prices and the decreasing number of family farms, attention has turned to farm diversification and viability. By growing a variety of crops - including trees - or by providing expertise in woodlot management, farmers have more options for income. Trees, including hybrids poplars, are ideal for diversifying farm income. They are often easy to establish; grow quickly; may coppice readily thereby ensuring multiple harvests[7]; and can be marketed for many different end uses.

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[6] Gene Garrett, University of Missouri at Columbia.

[7] Coppice: Regrowth that develops from dormant buds under the bark of tree stumps after the tree has been felled.

Agroforestry generally includes the following practices - all of which can have a significant place in Saskatchewan's agricultural industry:

1. Tree plantations
The planting and maintaining of short rotation intensive culture (SRIC) hybrid poplar plantations can be used as energy (fuel wood, electricity or converted to ethanol, for example) or as feed stock into Oriented Strand Board (OSB), pulp and paper or the specialty lumber industries and used as composite/engineered construction materials. Pulp produced from hybrid poplars can be a good substitute for that obtained from aspens. Poplar wood is used for pallets and shipping lumber, and better quality material has been used for furniture and moldings. Energy utilities are considering hybrid poplars as a renewable source of "biofuel" for clean burning in electrical power generating facilities[8].

2. Alley cropping
Growing trees in rows at wide spacing with a companion crop in the alleyways. Taking land out of annual crop production and planting trees often increases soil stability by adding organic matter, reducing erosion, and renewing soil nutrients via fall leaf drop.

3. Silvopasture
Combination of trees with domestic forages and grazing livestock. Carbon sequestration in the tree component may offset the emissions associated with livestock and help make the greenhouse gas (GHG) balance positive over the entire system.

4. Riparian forest buffer
Strips including combinations of perennial vegetation planted between cultivated fields and waterways to reduce runoff and non-point source pollution and enhance water quality. Trees also contribute to the aesthetic, recreational, and environmental quality of urban and rural areas.

5. Shelterbelts
Growing trees in rows several hundred feet apart to protect homes, crops and livestock from wind and/or snow.

6. Forest farming
Growing specialty crops in managed natural forest stands (for example, gourmet mushrooms, a multi-million dollar industry). Wildlife diversity may also be enhanced.

Agroforestry can be made to provide farmers and other groups (First Nations people are probably the best example) with options for land utilization on the Prairies that would provide them with a meaningful and stable income and be good for the environment.

Trees grown from an agroforestry undertaking could have many uses in Saskatchewan. A numbers of these are enumerated below:

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[8] The William F. Heckrodt Program of Excellence for Fiber Crop Development and Utilization.

In the forest fringe (a distance of approximately 100 km south of the current boundary of the boreal forest):

- Contribute to the provincial timber supply; provide for tree plantations to be used in the pulp and paper industry, OSB plants and other timber products plants situated in Prince Albert, Meadow Lake and Hudson Bay areas (the availability of trees currently harvested in the northern provincial forest will be substantially reduced within the next 10 - 15 years);

In suitable locations around the province:

- In tree plantations for use as feedstock in the ethanol industry; renewable feedstock into power stations (Greenpower); feedstock into new industries to be located in the area (e.g. specialty lumber industries and used as composite/engineered construction materials);
- As riparian buffer strips to improve the quality of the water and act as snow traps and shelterbelts;
- Around intensive livestock operations - feed stocks and hog barns - to control waste products and odour;
- Incorporated in silvopasture operations incorporating animals (cattle, buffalo, specialty livestock, sheep) in an environmentally sound operation that provides income from the trees, the understory and the animals;
- Used by landowners to provide a source of income from diversified or specialized crops: Alley cropping (trees and wheat for e.g.); specialty products (gourmet mushrooms, ginseng, fruit and nuts, hunting facilities); specialty wood products (pallets, high-value wood products);
- To provide for enhancement of the environment and biodiversity;
- It is very likely that some form of GHG credit system will be operational in Canada and around the world. Growing trees will provide a further source of income through the sale of these "credits" by landowners who grow trees - carbon sequestration in trees could be worth a substantial sum of money to land owners, though much uncertainty remains;
- Proper woodlot management can provide income from existing tree stands on farmland.

The intensive land management project

The goals of the intensive land management project are to support the development of commercial and environment-friendly farm forestry as an integral part of a sustainable agricultural system and to supplement and protect the biodiversity and natural resource base of Saskatchewan. Given appropriate research development and extension, agroforestry could become a widespread, profitable and sustainable system of land use.

Work on agroforestry needs to focus directly on the following:

- Research;
- Education;
- Extension, and;
- Promotion (marketing);

Three university programs are reviewed in this report. Attention is drawn to "key points" as each program is reviewed. Final recommendations for adapting an agroforestry program in Saskatchewan are offered at the end of this section.

The expected initial budget for the development of a successful program for the intensive management of agricultural land as described in this report is approximately $5,000,000 - $10,000,000[9]. This money is required to purchase suitable agricultural land for research purposes, hire full-time staff, provide offices etc. Much of the work will, however, be collaborative and interdisciplinary, undertaken by faculty, other researchers and extension personnel on a program-by-program basis. The individuals brought into the program who are not full-time employees will have their work and research funded by the program.

In Saskatchewan, the agroforestry industry needs to be developed through a long-term, sound and effective partnership made up of equal partners committed to the success of the enterprise. Evidence gathered in the United States indicates that this is indeed possible and that options to restore confidence in the agricultural sector of the economy through the development of the agroforestry industry are achievable.

It is difficult to place an exact dollar value on the returns that could be obtained from the development of the industry. Looking at the range of possibilities and what is achievable, revenues generated from applying various options in the province could be well into the hundreds of millions of dollars over the next 20 years.

Institutions who would all be asked to provide the initial start-up funding as joint partners in the project could include:

- Saskatchewan Agriculture and Food;
- Saskatchewan Environment and Resource Management;
- Saskatchewan Energy and Mines;
- SaskPower;
- SaskEnergy;
- University of Saskatchewan;
- Ducks Unlimited;
- The government of Canada;
- Agriculture and AgriFood Canada (including PFRA),
- Natural Resources Canada (including the Canadian Forest Service);

[9] In 1998, Australia budgeted $4 million, sourced from the Natural Heritage Trust, for farm forestry research. A total of $2.5 million has been made available to assess new tree-crop products and industries with an emphasis on native species.

- Environment Canada;
- Industry Canada;
- The Climate Change Action Fund;
- First Nation organizations;
- Industry groups within the province;
- Other institutions such as the Forest 2020 Secretariat;
- Saskatchewan Research Council;
- Prairie Adaptation Research Collaborative;
- Personal donations.

Fundamental Issues

- Agroforestry can play a very important part in diversifying Saskatchewan's agricultural and economic base and in providing a source of income to land owners;
- There is no program in place in Canada as contemplated in this report - this gives the province and the university an opportunity to take a leading role in setting up the industry in Canada;
- The United States, as well as other countries such as Australia and New Zealand, are far advanced in developing agroforestry programs; Until the industry is established here, we can "piggyback" research and extension services through cooperation agreements with universities in the U.S.A.;
- Large amounts of resources will initially need to be devoted to develop the program;
- Diversified groups within the province will need to work together as joint partners to make the program work.

Recommendations

- Immediately set up cooperative research programs with U.S. universities to educate and train individuals in agroforestry practices for application in Saskatchewan. The University of Guelph in Ontario may also be included in this program;
- "Grow" the program from within i.e. only graduate students (M.S. and Ph.D. level) interested in developing agroforestry research and outreach in Saskatchewan will be drawn into the program. Graduate assistantships and stipends will be provided to cover the cost of in and out-of-province tuition;
- Set up a formal "Program for Intensive Land Management on the Prairies" with appropriate "Joint Venture" partners; Set priorities; appoint director and administration staff; hire full time research staff and extension personnel;
- Provide for funding - Core funding expected to be at least $5,000,000 + "soft money funding";
- Determine research projects that address strategic issues:
    - Contribution to the provincial timber supply in the forest fringe area;
    - Biomass to foster and facilitate the development of biomass for energy source;
    - Determine range of other possible agroforestry systems;

- Purchase/rent initial 320 acres of suitable land for research purposes[10];
- Set up provincial workshops to develop a framework for the development of agroforestry in the province;
- Develop guidelines to communicate outcomes of key research projects (extension); Provide for farm forestry market information services (target users, delivery methods, implementation);
- Assess the socio-economic implications of the introduction of agroforestry systems to rural areas;
- Review economic, social and environmental implications of agroforestry systems in Saskatchewan;
- Determine how biodiversity conservation objectives can be incorporated into commercial farm forestry developments;
- Determine current knowledge of biophysical, and socio-economic processes associated with agroforestry systems.
- Determine methods to evaluate the effectiveness of vegetation management programs;
- Provide guidelines to optimize biodiversity;
- Investigate potential cost sharing arrangements for agroforestry systems;
- Determine how to increase land owner awareness;

[10] One possible option would be to link the agroforestry research land with land that the University will need to acquire for the relocation of the livestock farm.

The University of Missouri Center for Agroforestry,
College of Agriculture, Food and Natural Resources,
University of Columbia,
Missouri.

Meeting with:
Harold E. "Gene" Garrett - Director
Sandra S. Hodge - Technology Transfer and Outreach
John Shopland - Director, Horticulture and Agroforestry Research Center

The University of Missouri Center for Agroforestry is an interdisciplinary research, teaching and technology transfer program that draws on the expertise of the University of Missouri faculty in:

- Forestry;
- Fisheries and wildlife;
- Entomology;
- Plant pathology;
- Agronomy;
- Animal science;
- Agricultural economics;
- Rural sociology;
- Horticulture, etc.

The mission of the Centre is to initiate, coordinate and enhance agroforestry activities to meet the environmental, social and economic needs of land management in Missouri, North America and the temperate zone worldwide. The Centre has over twenty-five affiliated faculty from departments spanning both the biophysical and socio-economic sciences. Cooperation also extends to state agencies such as the Missouri Department of Conservation, and federal agencies, including the Natural Resources Conservation Service, and the USDA Forest Service Central Hardwood Research Station. Beyond Missouri, collaboration extends to personnel located at the USDA National Agroforestry Center in Lincoln, Nebraska and faculty at Iowa State University, USDA Agricultural Research Service, Booneville, Arkansas, and the Environmental Protection Agency (EPA). Funding for the Centre is "soft money" that extends into the many millions of dollars (probably in the range of US $10 million - US $20 million).

The University of Missouri's 660-acre Horticulture and Agroforestry Research Center is a key resource for education, research, training and demonstration. It is the focal point for agroforestry research in the State of Missouri and the Center for Agroforestry. Both basic and applied research is conducted in the biophysical and socio-economic sciences. Research undertaken there includes:

- The human dimensions of agroforestry adoption;
- Alternative crop production;
- Tree-crop interactions;
- Genetic improvement of high-value trees;
- Plant diversity and pest management;
- Mitigation of non-point source pollution;
- Shade and flood tolerance studies, and;
- Wood quality and utilization.

Current funding sources include the Agricultural Research Service and the Environmental Protection Agency. The EPA funding supports an Agroforestry Floodplain Program whose objectives are to research and demonstrate agroforestry's ability to generate income, reduce non-point sources of pollution, sequester carbon, create and improve wildlife habitat and mitigate against the impacts of periodic flooding. The Agroforestry Floodplain Program research effort includes support for graduate education.

Other long-term goals of the Center for Agroforestry include:

- Provide formal educational opportunities in agroforestry through the University of Missouri;
- Conduct, coordinate and promote interactive research on agroforestry practices to improve the production and protection functions of agricultural and forest lands;
- Conduct, coordinate and promote interdisciplinary research on the social and economic dimensions of agroforestry;
- Conduct, coordinate and promote interdisciplinary research on the policy dimensions of agroforestry;
- Develop and carry out a collaborative international agroforestry program in the areas of instruction, research and outreach;
- To conduct an outreach program in order to increase the awareness and adoption of agroforestry practices.

The instructional program of the Center for Agroforestry offers courses for graduate students interested in agroforestry practices, research and outreach. The Centre has graduate assistantships available at both the M.S. and Ph.D. level. Assistantships include a stipend and cover the cost of in-state or out-of-state tuition.

Key points:

- Large pool of resources;
- Full time staff + access to large pool of interdisciplinary faculty members;
- 20 + years in agroforestry education and extension;
- Willingness to do joint work with the University of Saskatchewan;
- Large agroforestry research centre;
- Little hybrid poplar work but extensive work in other areas of agroforestry (e.g. silvopasture);
- Extensive knowledge in the field of technology transfer;
- High level contacts with officials of the U.S. government;
- Large database;
- Large network of agroforestry experts;
- Established up-to-date workshop program;
- Can send students there immediately.

The William F. Heckrodt Program of Excellence for Fiber Crop Development and Utilization,
Department of Forest Ecology & Management,
College of Agricultural and Life Sciences,
University of Wisconsin - Madison,
Wisconsin.

Meeting with:
Glen R. Stanosz - Program Director
Jill M. Calabro, Associate Outreach Specialist
Martha Rosemeyer - University of Wisconsin, Department of Agronomy
Gregory Rebman - Natural Resources Conservation Service, U.S. Department of Agriculture

The William F. Heckrodt Program of Excellence for Fiber Crop Development and Utilization was established from a grant of approximately US $2 million by Mr. Heckrodt. The program supports outreach and research to develop and utilize poplar and other trees as sources of raw materials to meet the future fiber, timber, and energy needs of Wisconsin.

A director drawn from the faculty in consultation with the Program Advisory Council runs the program. This council consists of:

- The program's faculty director;
- Mr. William Heckrodt;
- Two forest science faculty members, and;
- Forest industry and energy industry representatives.

The faculty director is responsible for fostering cross-departmental, interdisciplinary activities, both outreach and research oriented. The fiber crop outreach specialist accomplishes the outreach goal of the program. The research goal is accomplished through the research work of the faculty director and through the combined research efforts of faculty across the University of Wisconsin - Madison campus as solicited by the faculty director. The faculty director is the recipient of the Heckrodt Professorship to support his research program in this area.

The fiber crop outreach specialist coordinates the acquisition and dissemination of existing practical information on poplar profitability, establishment, and growth. This includes data on:

- The best available clones;
- Site preparation;
- Planting;
- Maintenance practices, and;
- Pest management.

This information is integrated into guidelines with the goal of empowering growers to realize maximum returns.

The outreach specialist also established demonstration plantings for grower education and to compare clonal responses to different practices and site factors. Additionally, the outreach specialist develops university literature and other educational materials targeted at Wisconsin growers and acts as a liaison and conduit of information from other institutions and agencies including the U.S. Forest Service. Finally, the outreach specialist conducts field days,

workshops, and demonstrations to stimulate poplar plantation establishment. The outreach Specialist provides a quarterly report of activities to the Advisory Council.

A competitive grants program funded by the program solicits proposals in the most relevant areas. Prospective areas of emphasis include, but not limited to:

- The development and commercialization of the poplar resource;
- Establishment and culture to maximize productivity and return on investment;
- Maintaining and increasing productivity through determining the best pest management strategies and the best practices for their application
- Processing and utilization of fiber crops, including the potential use in added value products;
- Determining the profitability and economic contribution to individual Wisconsin communities and the state economy, and;
- Discovering, documenting, and disseminating the environmental benefits of fiber crops and enhancing their positive environmental impact (including energy generation and conservation, carbon sequestration, water quality, and wildlife benefits).

Key points:

- Large pool of resources;
- Full time staff + access to large pool of interdisciplinary faculty members;
- 5 + years in agroforestry education and extension;
- Willingness to do joint work with the University of Saskatchewan;
- Extensive hybrid poplar work;
- Extensive work with industry;
- Extensive knowledge in the field of technology transfer;
- Large database;
- Large network of agroforestry experts;

The Center for Integrated Natural Resources and Agricultural Management (CINRAM),
College of Natural Resources,
University of Minnesota,
Saint Paul,
Minnesota.

Meeting with:
Erik Streed, Program Manager

CINRAM is a partner-based organization that catalyzes the development and adoption of integrated land use systems. CINRAM links the expertise of the University of Minnesota with the experience and insights of people and organizations who work with, and have an understanding of, opportunities and issues across the landscape.

CINRAM objectives include:

- Coordinating and implementing research and extension projects related to agroforestry and other integrated land use systems. Focus is on applied research on the financial impacts of specific agricultural and land use practices, so that farmers and landowners can evaluate potential profits of specific practices. Particular emphasis and experience with economic and financial analysis of growing hybrid poplar as an alternative agricultural crop.
- Linking University educators, public agency staff, landowners, business people, and others interested in integrated land use;
- Promoting and conducting educational and training activities throughout Minnesota;
- Serving as a clearinghouse and referral center for agroforestry and integrated natural resources and agricultural management;
- Encouraging a landscape level, integrated watershed approach in natural resources and agricultural management.

CINRAM encourages:

- Practices that use the land to meet both present needs and to protect its long-term integrity. The Centre attempts to build awareness of, and appreciation for, connections that already exist - between field, forest and town, producer and consumer, land use and water quality, families and farms, and between urban and rural communities.
- Profitable technologies and practices that mesh diverse land uses - crop production and water quality maintenance, agroforestry and wildlife protection, livestock production, and soil enhancement.
- Connections among individuals - researchers and farmers, agriculture and natural resource professionals, and local government leaders and the University faculty, landowners and environmentalists, industry representatives and public agency staff - who help make and implement land use decision.

The result in new links that lead to approaches that simultaneously nurture profitable businesses, thriving communities, and a healthy environment.

CINRAM has direct links to the Agricultural Utilization Research Institute's (AURI), which was created to foster long term economic benefit through increased business and employment opportunities to rural Minnesota through:

- The identification and creation of new markets for new or existing commodities, ingredients and products;
- The development of new uses or value improvements for Minnesota agricultural commodities.

AURI supports the work done by the Minnesota Hybrid Research Cooperative, which was formed in 1996 with the support of the state of Minnesota. Its mission is to:

- Produce genetically superior cottonwood and hybrid poplar trees;
- Improve cultural practices and increase wood yields;
- Provide technical assistance to cooperative members and the public.

The focus of the Cooperative is to provide a research base to produce wood fiber that has high value to the grower and the industry user. The development of new and improved cultural practices should bring costs down to increase profits to the farmers who are growing trees an alternative agricultural crop.

The current members of the cooperative include industry and research institutes:

- The Agricultural Utilization Research Institute;
- Blandin Paper Company;
- Boise Cascade Corporation;
- Champion International;
- Lee Nursery;
- Minnesota Power;
- Potlatch Corporation;
- The University of Minnesota, Crookston;
- The University of Minnesota, Natural Resources Research Institute;
- WesMin RC&D; and;
- Terra International.

Projects being implemented at this time are:

- Breeding and field-testing of new hybrids;
- Evaluation of various planting and maintenance practices;
- Evaluation of existing hybrids from throughout the northern hemisphere.

Key points:

- Large pool of resources;
- Full time staff + access to large pool of interdisciplinary faculty members;
- 10+ years in agroforestry education and extension;
- Extensive knowledge in the field of technology transfer;
- Willingness to do joint work with the University of Saskatchewan;
- Large agroforestry research centre in Duluth and elsewhere in Minnesota;
- Contract with the U.S. Department of Energy to research the use of wood products in electricity power plants;
- Extensive poplar work + work in other areas of agroforestry;
- Large database;
- Link to the Agricultural Utilization Research Institute;
- Large network of agroforestry experts;
- Established up-to-date workshop program;

National Agroforestry Center,
University of Nebraska at Lincoln,
Lincoln,
Nebraska.

Meeting with:
Greg Ruark - Center Director
Michele Schoeneberger - Research Program Leader/Soil Scientist

The USDA National Agroforestry Center has its origins in the 1990 Farm Bill. It began as a Forest Service effort in 1992 and expanded into a partnership with the U.S. Natural Resources Conservation Service in 1995. The National Agroforestry Center conducts research on how to design and install forested buffers to protect water quality and develops and delivers technology on a broad suite of agroforestry practices to natural resource professionals who directly assist landowners and communities.

Research & Development
Tree-based Buffer Technologies for Sustainable Land Use. Research conducted on:

- Studies to improve the understanding on how forested riparian and upland forest buffers function to protect water and aquatic environments from soil sediments, excess nutrients, and pesticides;
- Site-based studies for improving the ability to design and install these buffer systems under a variety of environmental conditions in order to meet landowner objectives, and;
- Landscape-scale studies to guide the strategic placement of forested buffer systems in watersheds for the purpose of maximizing water protection, while optimizing for other benefits, such as wildlife habitat, carbon sequestration, and economic diversification.
-

Technology Transfer & Applications
The Center develops and delivers agroforestry technology on a broad suite of agroforestry practices that fall into six categories:

- Windbreaks
- Riparian Buffers
- Alley Cropping
- Silvopasture
- Forest Farming
- Special Applications

The Center gathers and packages research conducted by universities and state and federal agencies into technology transfer materials. Products include field demonstrations, training workshops, a quarterly newsletter, technology "how to" notes, videos, and brochures with coordinating displays.

Key Issues that have been addressed include:

- **Carbon**: Agroforestry often involves afforestation. Planting "linear forests" on farms and ranches can store large amounts of carbon due to an extensive agricultural land base.

- **Communities**: Trees at the community/agriculture interface provide visual screening, dust and noise abatement, modify temperature extremes, and provide greenways and recreational settings.
- **Economics**: Agroforestry practices, like alley cropping and forest farming, diversify production systems and generate additional on-farm income.
- **Livestock**: Trees shelter livestock from harsh weather and reduce visual and odor problems associated with concentrated feedlots. Agroforestry systems allow for forage production and livestock grazing in the understory of conifer stands that are managed for timber production.
- **Snowfences**: Trees and shrubs used as "living snowfences" control drifting snow along roadways, distribute snowmelt in fields, protect farmsteads and communities, and provide wildlife habitat.
- **Water**: Forested riparian buffers improve water quality by controlling soil and stream bank erosion and by reducing the input of agricultural fertilizers, pesticides, and animal wastes into waterways.
- **Windbreaks**: Many field windbreaks have aged and deteriorated. They need to be replanted or rehabilitated in ways that provide for erosion reduction, crop protection, and wildlife habitat.

Key Points

- Main U.S. government research and technology transfer centre;
- Access to large resource pool;
- Full time staff;
- Extensive knowledge of the industry;
- Willingness to work with governments of Canada and Saskatchewan to develop centre;
- Extensive network of researchers worldwide;
- Large accessible database.

Further Examples of Work in Agroforestry

PFRA Shelterbelt Centre, Indian Head

Resources have been allocated to the development of improved tree and shrub species for conservation and agroforestry plantings in the prairie and parkland regions. The program has focused on assembling genetically diverse populations of native and introduced species; regional testing of candidate species; development of genetically superior seed sources through breeding programs and establishment of seed orchards and selection of superior clonal plants. The objective of the native woody plant improvement program is to assemble populations from the native range of a species, comparatively evaluate the ecotype, select superior plants, and increase by sexual propagation and release as adapted seed propagated cultivars.

Land near the Centre in Indian Head is being used to provide stooling beds for the propagation of the hybrid poplar cuttings (the number of cuttings envisaged may be in the millions). Demand for hybrid poplar cuttings currently exceeds available supply.

PFRA and AAFC are also hosting the seventh biennial conference on agroforestry in North America and the annual conference of the Plains and Prairie Forestry Association in Regina from August 13 - 15, 2001

Cumberland Regional College, Nipawin, Saskatchewan

Saskatchewan's Department of Post-Secondary Education and Skills training is funding a project (the agroforestry course development project) to develop an educational and training program that accomplishes the following objectives:

- Encourage the development of small-scale forestry in the agricultural sector;
- Provide the technical skills required to practice sound resource management independently;
- Promote a healthier landscape;
- Develop courses applicable to the Saskatchewan woodland outside the provincial forest.

Forest Management Companies in Saskatchewan

The Saskatchewan forest management companies (Mistik Management etc.) are currently examining the establishment of their own agricultural land area for growing hybrid poplars.

Carbon Sequestration By Hybrid Poplars In The Pacific Northwest (Washington State University)

The intent of this work is to develop a mitigation strategy to enhance biological conversion of CO_2 into a stable form to provide for long-term sequestration of carbon. The project addresses the issue of increasing plant and soil carbon sequestration by altering existing ecosystems through the conversion from low productive, unimproved pasturelands to fast growing hybrid poplar plantations in the Pacific Northwest. The project utilizes rapidly growing hybrid poplar clones from the Washington State University Poplar Research Program,

coupled with the development of a poplar growers association to provide the technical assistance needed for the conversion of available pasturelands into productive poplar plantations.

In Phase I, the available land area will be determined for both non-irrigated and irrigated plantations based on soil type, topography and pH, and the feasibility of forming a poplar growers association to provide technical information for plantation establishment and management will be assessed. Important biological questions will also be addressed in Phase I including selection of hybrid poplar clones based on growth rates, wood density and lignin content, and initial studies to determine rates of below-ground carbon sequestration in tree and soil carbon pools.

In Phase II, the growers association will be formed with existing poplar growers and additional landowners will be identified, brought into the growers association, and provided economic incentives and technical assistance to establish poplar plantations on their lands. The biological research will be continued to further develop estimates of carbon sequestration rates, both in controlled environment and field situations, with an emphasis on understanding and modeling below-ground processes of woody root growth, fine root turnover and contribution to soil carbon pools. Depending on the results of the wood density and lignin analysis in Phase I, breeding for or genetic engineering of, high lignin content clones for deployment in new plantations would be pursued.

Poplar-Willow Technology Network

The purpose of the Poplar-Willow Technology Network is to develop a national U.S. network of experts to provide technical support for individuals, private companies, city, county, state and federal agencies interested in using fast growing tree species for wastewater treatment and other similar types of tree-related environmental projects.

Attachment #2: Draft Letter to NSERC

25th September 2001

NSERC
350 Albert Street
Ottawa, Ontario
K1A 1H5

Dear Sir/Madam,

This letter of intent serves as our application for funding of a network under the Research Networks Grants program. The network is to be known as the National Afforestation and Agroforestry Research Network.

The letter has been divided into 5 sections:

1. Network Objectives;
2. Afforestation and Agroforestry - Concept and Definition;
3. Afforestation and Agroforestry Questions, Themes, and Issues (environmental, regulatory, biotechnology, social, economic and others);
4. Conceptual Structure of the Network;
5. Implementation Phase.

1 Network Objectives

The objectives of the National Afforestation and Agroforestry Research Network are:

- To foster research and the creation of knowledge and expertise in afforestation and agroforestry that can most effectively be developed through large-scale multidisciplinary research projects;
- To address a new national/provincial objective related to afforestation and agroforestry through intensive and extensive research and networking;
- To initiate and facilitate collaboration between industry, university and college-based researchers and other sectors;
- To coordinate the transfer of research knowledge and expertise to Canadian-based organizations;
- To initiate and further develop the capacity for the training of highly qualified personnel;
- To further the advance of knowledge, research, outreach and technological dissemination;
- To assist in the development of a sound and vibrant national afforestation and agroforestry infrastructure through peer review and applied and pure scientific research.

The network will provide for an interdisciplinary research, teaching and technology transfer program that draws on the know-how of experts in forestry, wildlife management, soil science, entomology, hydrology, plant pathology, engineering, biotechnology, environmental science, agronomy, animal science, economics, rural sociology, horticulture and climate change.

The network will generate a focus for input into collaborative work on the educational opportunities associated with afforestation and agroforestry in Canada; coordinate and promote interdisciplinary research on afforestation and agroforestry policy, practices and the social and economic dimensions; coordinate and promote interdisciplinary and collaborative research on the wide ranging dimensions of this new sector in Canada and within the North American and International context.

1 Afforestation and Agroforestry - Concept and Definition

Throughout the world (except possibly Canada) afforestation and agroforestry have evolved as a sustainable resource and intensive land management option for farmers and industry.

Afforestation is the intentional planting of trees for commercial or industrial purposes on agricultural land that has not previously had trees or where the trees have been removed for agricultural purposes. Agroforestry represents the use of these trees within a systems approach such as silvopasture, fiber supply allocation, companion planting and phyto/bioremediation. Agroforestry combines agriculture and forestry through a set of guidelines formulated to create a more integrated, diverse and sustainable land-use system.

It is imperative to note that afforestation (within the context of this letter) and agroforestry represent neither forestry nor agriculture per se but are fully-fledged entities of their own that includes guidelines and principles drawn from both forestry and agriculture but within their own physical, economic, scientific and technical framework. For this reason, few Canadian academic institutions have researched this topic to any degree.

The agroforestry value-chain from landowner to end use product needs to be developed through a long-term, sound and effective research and industry partnership made up of equal partners committed to the success of the enterprise. Evidence gathered in the United States indicates that this is indeed possible and that efforts to restore confidence and faith in the agricultural/forest sector of the economy through the development of the agroforestry industry are achievable.

Afforestation and agroforestry as a land-use practice should satisfy all of the following criteria: Intentionally designed and managed; intensively managed to maintain land base productivity and protective function; interactively manipulates biological and physical interaction between animal and crop components with the goal of sustainable activity, and be integrated to help balance economic production with resource conservation.

This sector in its broadest sense is totally new to Canada as it focuses on industrial fiber plantations and intensive land management[11]. Time is also a critical factor. Canada needs to get tree plantation in the ground rapidly - the basic research needs to be undertaken immediately whilst keeping in mind that the essential component will be to get landowners

[11] The key words here are "plantations" and "intensive". Canada's forests are not "plantations".

across the country involved. This will be a challenging, though not unattainable, task. Also, existing research on industrial plantation activity and their long-term impact is limited. Universities and industry in Canada have not considered large-scale afforestation and agroforestry in the past and government departments have specific mandates that do not necessarily address afforestation and agroforestry today.

The door is open for increased social science activity, research, education, new business, First Nation and Metis participation, legislative and regulatory changes, advanced wood technology, biotechnology and composite and engineered wood product lines as well as a way to begin to address climate change on a potentially broad scale.

1 Afforestation and Agroforestry - Questions, Themes, and Issues

The following is not a comprehensive list of the themes or issues associated with afforestation or agroforestry but it does serve to establish the complexity associated with these activities and to show the need for a network of research institutions[12]. For each of the issues, it is expected that the number of Masters and Ph.D students in any respective program at any one time will be sufficient to warrant a sizable number of student drawn from Canada and internationally each year. Supervising Committees will in all cases be made up of network participants.

I. Environmental Issues

- Intensive management and the impact of successive long term rotations on long-term sustainability; soil regenerative capacity; nutrient cycling efficiencies; microclimate modification;
- Impact of plantation evapo-transpiration on hydrological cycles, climate change and groundwater supply (aquifers);
- Nitrogen fertilization and impact on groundwater and benefits, mitigating impact of phyto and bioremediation;
- Identify methods to reduce pesticide and herbicide applications on the land base;
- Effects of intensively managed monocultures on biodiversity and indigenous species (cross fertilization);
- Assessment and cost-benefit analyses of municipal waste water, intensive livestock waste and drip irrigation on tree production and wood density;
- Determine impact of large hybrid plantings on insect and disease, fire incidence;
- Impacts of large-scale plantings on energy and materials exchange between the atmosphere and the terrestrial surface;
- Determining impact of increased livestock operations and methane gas and correlation with planting efforts to reduce greenhouse gas emissions;
- Impact of large-scale plantings in mitigating or slowing anticipated climate change; above and below ground biomass assessment;
- The Intergovernmental Panel on Climate Change (IPCC), the Kyoto Protocol and carbon accounting methodology;
- Review of irrigation, utilization of urban sewage, and utilization of tree plantation in animal waste management;

[12] As pointed out in this letter, the decisive "critical factor" will be to get landowners (mostly farmers) to grow trees as plantations. For over a hundred years, farmers have been taught to cut down trees.

- The role of agroforestry systems in sequestering carbon in agricultural landscapes;
- How can plantations, block plantations, alley cropping and silvopastoral activities be utilized to improve or enhance wildlife management;
- What are some of the beneficial impacts of tree plantations on filtering water, biodiversity, preventing soil erosion;
- Can large-scale plantings decrease flooding by slowing the rate of snowmelt and reducing runoff?

II. Regulatory Issues

- Identification of best regulatory strategy/position for afforestation and agroforestry-based activity given international discussions on carbon sequestration and carbon credits;
- Engineered wood development or opportunities might require new national regulations and standards to be developed for use in industrial and commercial structures;
- Ensuring integrity of indigenous biodiversity, while recognizing the potential need for exotic or other species introduction in the wake of climate change impacts;
- Financial or tax incentives for enabling long term contracts on resource issues;
- Need to assess and forecast / model opportunities associated with a new fiber infrastructure, e.g.; business opportunities based on timber species and proximity to mills;
- Long term nature of afforestation (15 to 20 year rotations) and identification of issues impacting the development of the opportunity, and how agroforestry activity could be used to generate short term financing, combination products (wood and straw fiber) and other research opportunities.

III. Biotechnology Issues

- Biotechnology and hybridization will require protocol development and genome identification to ensure private nurseries will have the material that is identified as acceptable for afforestation purposes;
- Cross-fertilization and the impact on existing species;
- Environmental impacts of transgenic tree varieties, e.g. Bt poplar;
- Ethanol potential and the utilization of woody material: enzymatic processes for lignin breakdown;
- Determination of rot in aspen and poplar as a genetic or environmental issue;
- Need for hardwood hybridization and testing of clonal material for hardiness, drought resistance and form;
- Examining the potential for other species introduction and the genetic issues surrounding it;
- Developing frost hardiness; new tree form; ability to increase photosynthesis, other product line development;

- Planting material used for agroforestry;
- Genetic enhancement of agroforestry;
- Biotechnology and Genetic Engineering approaches utilized by researchers elsewhere in the world.

IV. Social Issues

- The socio-economic principles associated with incentives, deferred tax etc.;
- The role of women, farmers, First Nations, Metis, and cooperatives in agroforestry;
- The role of the legal system and contract law;
- The psychological and social services impact of a new sector inspiring hope in the farming sector;
- The role of agroforestry in rural revitalization;
- Where is Canada willing to go in attributing "concrete" values to environmental issues, biodiversity and associated questions?

V. Economic Issues

- The technologies and equipment needed in developing and managing agroforestry;
- The commercial use of new and existing product lines;
- What is the full range of opportunities for the development of agroforestry?
- International markets for wood products and anticipated demands and trends;
- Assessment and review of existing global activities and identification of activities that might be transferable;
- Harvesting methods and yield of agroforestry;
- Economic and business analyses of agroforestry;
- Industries dependent on agroforestry as a raw material;
- Forecasting and modeling methodologies;
- Opportunity costs of agroforestry/afforestation versus traditional agriculture;
- Other infrastructure requirements.

VI. Other Important Issues

- Is there a need for a Canadian inventory of industrial plantations[13];
- How should Canadian and international policies and strategies on this sector evolve;
- Forests and trees are a large employer with important economic impact across Canada.

The list of topics that need to be researched has other wide-ranging interdisciplinary implications. For example, aside from the above, transportation issues and alternatives for enhancing the distances that can be hauled and the effect of haul weights on the environment (for example, damage to roads) and the role of rails needs to be reviewed ahead of time and

[13] The Sinks Table that was part of the National Climate Change Process, has also recommended that 50,000 hectares of private land across Canada be planted over five years (2001-2005), using fast-growing tree species and that shelterbelts on private land in the Prairie Provinces be planted each year from 2001-2015 (15 years), with a target planting rate of 13,000 ha per year and that Block plantations on private land in the Prairie Provinces be planted each year from 2001-2015 (15 years), with a target planting rate of 20,000 ha per year.

strategies to mitigate damage implemented. There is also a need to consult with the major forestry companies to determine the type of program that they would view as desirable for their future human resource needs. The forest industry in Canada has an interest in intensively managed plantations to provide for their timber and fibre supply, as much of the natural forests available for harvest are increasingly distant from the lumber or pulp and paper plant and are facing increased pressures to set aside land for conservation and environmental reasons.

1 Conceptual Structure of the Network

The three traditional areas of university activity - teaching, research, and outreach - will need to be coordinated. Linkages will also need to be established among:

- Universities, technical and regional colleges in the teaching areas;
- Government, universities, research councils and other organizations, and the private sector in the research areas;
- Extension programs in the technology and know-how transfer areas.

The network must make sense in a broad context and certainly within the situation as it pertains to the Canadian economic, social and environmental situation. However, very limited knowledge of how to set up an integrated afforestation and agroforestry program that will satisfy the needs of the general academic community, government, the public, researchers, farmers and corporations and how to coordinate the various other interest groups is currently available in Canada - hence the need for strong network linkages.

It is envisioned that the network will comprise three levels[14]:

- The Regional Levels (Western level led by the University of Saskatchewan and the Eastern Level led by the University of Guelph);
- The Canadian Level, and;
- The North American Level.

The following universities, research agencies, government departments and researchers have expressed interest and/or support for a network of this nature at the levels indicated (names in italics will be approached). All the institutions mentioned have research capacity/capability. Dr Andrew Gordon (University of Guelph) will provide the necessary linkages to institutions located in the Eastern Level (OMAFRA etc.).

Regional Level

- University of Saskatchewan (Dr. Ken Van Rees - Regional Leader);
- University of Guelph (Dr. Andrew Gordon - Regional Leader);
- University of Alberta (George W. Powell);
- *University of British Columbia;*
- *Université Laval (Dr. Robert Beauregard);*

[14] This is an emerging industry in Canada that is however very well developed in other parts of the world. As a result many of the issues related to how the network should function to meet Canadian conditions still need to be developed under realistic conditions. The concept of the East/West levels may not be practical but this will need to be determined once work on establishing the network is undertaken.

- *University of Manitoba.*

Each University will provide input into one or more "Issues" as set out in Section 3 of this letter. For example, the University of Saskatchewan will provide linkages to the following institutions located in Saskatchewan.

- Saskatchewan Agriculture and Food (Ron Witherspoon);
- Saskatchewan Environmental and Resource Management (Bob Ruggles);
- Saskatchewan Research Council (Dr. Mark Johnston);
- Saskatchewan Energy and Mines (Trevor Dark);
- PFRA (Dr. Bruce Neill);
- SaskPower (Ian Shepanik);
- *Agriculture and AgriFood Canada (Dr. Wayne Lindwall - Swift Current Research Station);*
- SaskEnergy (Bernie Ryma);
- AgWest Biotech (Peter McCann);
- Saskatchewan Agrivision Corporation (Al Scholz);
- Federation of Saskatchewan Indian Nations (FSIN);
- NRC - Plant Biotechnology Institute (Dr Kutty Kartha);
- Saskatchewan Economic and Cooperative Development (Larry Spannier);
- Saskatchewan Forest Centre (technology transfer);
- *Council of Saskatchewan Forest Industry (Brock Folckerson);*
- *Weyerhaeuser (Steve Smith);*
- *Mistik Management (Mike Martel);*

The University of Saskatchewan has a strong background in all fields of agricultural research (animal science; crop science; agricultural economics; greenhouse operation; soil science; microbiology and food science etc.) and so can provide input into the agricultural science needs of the agroforestry program. It also has a very strong history in extension and technology transfer to agricultural producers. The expertise available within the College makes it the obvious choice to lead and manage the research and technology transfer program envisaged for the network in the Western Level.

Other relevant centres established at the university include: the Virtual College of Biotechnology; the Centre for Studies in Agriculture, Law and the Environment (CSALE); the Saskatchewan Land Resource Centre (SLRC); the Prairie Swine Centre Inc; the Canadian Light Source synchrotron project - Canada's largest science and technology project in a generation; the Institute of Space and Atmospheric Studies (ISAS); the Crop Development Centre; the NSERC/SSHRS Chair in Managing Knowledge-Based Agri-food Development (managed by Dr. Peter Phillips). The University is also central to the development of Canada's most vibrant agricultural research and development community, which has become world famous for the application of biotechnology in the agriculture industry; the University is also home to Innovation Place, one of the most successful research parks in North America with over 100 organizations in industries such as agriculture, computing and telecommunications, pharmaceuticals, novel foods, and the environmental sciences.

The Canadian Level would link the Regional Level with national institutions and organizations located in other provinces.

- The Canadian Council of Forest Ministers (the Forest 2020 Secretariat – [Mary Mes-Hartree]);
- Natural Resources Canada (Dan Wicklum – NRCan Minister's Office);
- Canadian Forest Service (Diana Boylen);
- *Western Economic Diversification (Doug Maley);*
- *Environment Canada;*
- *Sustainable Forest Management Network (Dr. Terry Veeman);*
- *Climate Change Secretariat (Mark Ziegler);*
- *The National Research Council (Dr. Peter Hackett);*
- *Agriculture and AgriFood Canada (Ottawa office);*
- *Ducks Unlimited;*
- *The Poplar Council of Canada; (John Doornbos);*
- *FORCAST (Mike Apsey);*
- *BIOCAP (Dr. David Layzell)*

The North American Level would link the Canadian Level with institutions in the United States that are the leading researchers in agroforestry practices[15]:

- University of Wisconsin (the William F. Heckrodt Program of Excellence for Fiber Crop Development and Utilization);
- The University of Missouri Center for Agroforestry;
- The University of Florida Center for Subtropical Agroforestry;
- The Association for Temperate Agroforestry (AFTA);
- The USDA National Agroforestry Center (NAC) at the University of Nebraska at Lincoln;
- Washington State University Poplar Research Program, and;
- The Center for Integrated Natural Resources and Agricultural Management (CINRAM) at the University of Minnesota.

Other universities that could, in due course, be invited to participate in the network include the University of Wales, Bangor and the Institute of Water and the Environment at Cranfield University in the UK and the University of Melbourne in Australia - all universities that have extensive research facilities in agroforestry.

1 Implementation Phase

The expected budget for the initial development of the National Afforestation and Agroforestry Research Network as described in this letter will be approximately $1,000,000 to $2,000,000 or more[16]. This money is required to hire full-time staff (Issues or Level managers), provide offices, obtain assistance in developing the implementation structure,

[15] All U.S. universities have been approached about participation in the network and all have shown a great deal of support.
[16] In 1998, Australia budgeted $4 million, sourced from the Natural Heritage Trust, for farm forestry research. A total of $2.5 million has been made available to assess new tree-crop products and industries with an emphasis on native species. The Centre for Sub-Tropical Agroforestry located in Florida has received funding of over $5 million (U.S.).

travel costs etc. Much of the work will, however, be collaborative and interdisciplinary, undertaken by faculty, other researchers and extension personnel on a program-by-program basis. The individuals brought into the program who are not full-time employees will have their work and research funded by the program.

The existence of a network will bring together researchers who rarely, if ever, interact (for example, agriculture and forestry researchers). Agroforestry can be viewed as a distinct paradigm shift since the science and practice of agroforestry is poorly developed in Canada and needs to be built on. As described in this letter, the National Afforestation and Agroforestry Network is a multidisciplinary effort that will involve many scientists from many disciplines. They will need coordination assistance in order to clearly identify needs, establish joint models, gather and disseminate data and information, establish new contacts, understand the role of water, nutrient and carbon cycling, risk, disease, biotechnology, reduce duplication etc.

There is no doubt that the benefits of such a network to Canada are many-fold. The implementation of afforestation and agroforestry in this country will provide wide-ranging ecological, social and financial benefits to the farming community, agriculture and forest and the wood products industry.

Yours Sincerely,

Andre Hucq, Ph.D

College of Agriculture,
University of Saskatchewan